



## **Northern NY Agricultural Development Program 2019 Project Report**

### **Maximizing Both Alfalfa and Grass Quality of Mixtures**

#### **Project Leader:**

- Debbie J.R. Cherney, 329 Morrison Hall, Department of Animal Science, Cornell University, 607-255-2882, djc6@cornell.edu

#### **Collaborator(s):**

- J.H. Cherney, Soil & Crop Science, Cornell University
- Mike Hunter, Cornell Cooperative Extension, Jefferson/Lewis Counties
- Joe Lawrence, Cornell PRO-DAIRY

#### **Cooperating Producers:**

- Jefferson County: Lynn Murray, Murcrest Farm, Champion, NY
- Lewis County: Dallen Farney, Silvery Falls Farm, Lowville, NY
- Lewis County: Marc Larabee, Graceway Farm, Lowville, NY
- Lewis County: Garrett Pominville, Pominville Farm, Croghan, NY

#### **Background:**

While alfalfa quality is relatively consistent among varieties over regions, grass quality and yield are significantly impacted by region. Fiber digestibility (NDFD) declines over one percentage unit per day in spring growth, and spring harvest may account for up to half of the total forage yield used as forage for lactating cows. Although forage quality improvement was mostly ignored in the past by breeders, there are releases of new cultivars for both alfalfa and perennial grass that have the potential to greatly improve the quality of this forage mixture. The Northern New York Agricultural Development Program has thus funded field research to evaluate this potential for its regional crop growers and dairy farmers.

Using meadow fescue in mixture with alfalfa will significantly increase fiber digestibility of the mixture, and increase milk production. Not only are meadow fescues typically higher in fiber digestibility than other grasses, it now appears that there are significant differences in NDFD among meadow fescue varieties. There are more than 100 meadow

fescue varieties certified in Europe and most of them have not been evaluated for yield or quality in North America. For growers in northern climates, meadow fescue has the added advantage of being more winter hardy than tall fescue. Almost all of the meadow fescue varieties in Europe were selected in northern environments, many with more severe winters than northern NY. This research evaluates several variety options for their potential to enhance alfalfa-grass production by Northern New York growers.

### **Methods:**

The two primary concerns with alfalfa-grass mixtures are 1) achieving a 20-30% grass mixture, and 2) achieving the highest quality possible for the grass. The three experiments (4 farms) were established in 2018, and harvested in 2019, were established to answer these questions.

In May, 2018, we planted NNYADP-funded field trials at Murcrest Farms in Jefferson County and at Silvery Falls Farm in Lewis County. We seeded HarvXtra and Hi-Gest360 alfalfa in mixture with two meadow fescues (Tetrax and Minto), at 5 grass seeding rates (0.5, 1, 2, 3, and 4 lbs/acre).

Meadow fescue seed was collected from a number of European sources for evaluation in mixture with alfalfa. There was a 2-fold range in weight per seed, but the same number of pure live seeds/acre were planted for all meadow fescue varieties. In May, 2018, we planted Ameristand 427TQ alfalfa on the Marc Laribee farm (Graceway Farm) in Lowville, Lewis County, in mixture with 19 meadow fescue varieties and Bariane tall fescue. The average seeding rate for meadow fescue varieties was 2 lbs pure live seed/acre. On April 25, 2019, at the Garrett Pominville farm in Lewis County we planted the same study as on the Laribee farm, with 19 meadow fescue varieties.

The 19 meadow fescue varieties were: Tetrax, Liherold, Preval, Pradel, Barvital, Cosmonaut, Driftless, Hidden Valley, Tored, SW Revansch, Pardus, Barika, Barcrypto, Laura, SW Minto, Arni, Jogeva 47, Harlequin, and Hyperbola. Most of these varieties have not been evaluated in North America, and yield and quality in a northern NY environment are unknown. Many of these varieties were developed in colder, shorter season environments than Northern NY.

The Murcrest trial was harvested four times in 2019. The study on the Silver Falls farm was harvested three times. The meadow fescue-alfalfa plots at the Laribee farm were sampled at two harvests.

All samples were hand-separated into alfalfa and grass fractions at each harvest, with any weeds discarded. Harvesting required four individuals and multiple vehicles at the site, with refrigerated sample storage to preserve samples for separation and drying in Ithaca, NY. Up to eight individuals were available for the sample separations in Ithaca. Alfalfa and grass were analyzed separately for crude protein (CP), neutral detergent fiber (NDF), invitro true digestibility (IVTD), neutral detergent fiber digestibility (NDFD), Acid Detergent Fiber (ADF), and lignin.

## **Results (See Data in Appendix):**

### **HarvXtra, HiGest360 Trials at Murcrest and Silvery Falls (Farney) Farms**

#### **Yield and Grass Proportion**

Dry matter yield at both Murcrest and the Farney farm increased with increasing meadow fescue seeding rate (Fig. 1 & 2), but yield was much lower at Farney's, due to less than optimal soil conditions for alfalfa. Yield of HarvXtra was higher than Hi-Gest360 at Farney's and without difference (HarvXtra: 5.23 tons/acre vs. Hi-Gest360: 5.09 tons/ac at Murcrest (Table 1). Grass proportion in mixed stands was not influenced by the alfalfa variety at either site.

Struggling alfalfa at the Farney farm resulted in a very high grass percentage (>70%) in the mixtures (Fig. 3), which increased with increased grass seeding rate. Tetrax consistently was considerably lower in grass percentage in mixtures than Minto at both the Murcrest and Farney sites (Fig. 4). The only forage quality parameter consistently influenced by grass seeding rate was grass CP content (Fig. 5).

#### **Alfalfa Quality**

HiGest360 was higher in fiber than HarvXtra at the Farney farm, but not at Murcrest (Table 1). HarvXtra was 9% lower in lignin than Hi-Gest360 at Murcrest, but only 3% lower at the Farney farm. This resulted in a significant 4% increase in NDFD for HarvXtra over Hi-Gest at Murcrest, but no significant difference between the alfalfas for NDFD at Farney's (Table 1). Even though Farney's alfalfa was lower in total fiber than Murcrest, it was also lower in NDFD and CP than Murcrest. Alfalfa at the Farney site was stunted through the seeding year and the first production year, and never recovered to assume a normal appearance.

#### **Grass Quality**

Tetrax meadow fescue was consistently lower in fiber and lignin than Minto (Table 2). Tetax was also consistently higher in IVTD and NDFD than Minto at both sites. Tetrax averaged higher CP than Minto at Murcrest, but was likely due to the fact that the grass percentage in mixtures was considerably lower for Tetrax compared to Minto.

Grass quality was very similar between the two sites, with the exception of crude protein (Table 2). Grass CP was much lower at Farney's, primarily due to the weak alfalfa stand there. As is always the case, grass NDFD was much higher than alfalfa NDFD.

#### **Graceway Farm Meadow Fescue Variety Study**

The field at Graceway Farm was mowed at third harvest before samples were collected, so we have samples from two harvests in 2019. The well-fertilized sandy loam field was ideal for alfalfa, and the alfalfa stand was excellent. Average grass percentage for the 19 meadow fescues over two harvests was 30%, and the range was 20 to 38% (Fig. 6). All meadow fescue varieties resulted in higher grass% in mixtures than Bariane tall fescue. Some of the varieties ranked similarly to the same study conducted in Ithaca, but some varieties were very different in grass% between the two locations. The grass% in these mixtures is equally as important as the fiber digestibility of the grasses. While there was a two-fold range in grass% among the meadow fescue varieties, it is not yet clear if

varieties will rank similarly on different sites. We will be able to compare sites in 2020 when the Pominville site is harvested.

There was a range in fiber digestibility among meadow fescue varieties (Fig. 7), with all 19 varieties exceeding the NDFD of Bariane tall fescue. Hidden Valley was the highest in NDFD, and is the first modern variety generated in the USA from plants isolated on the Hidden Valley Dairy Farm in southwestern Wisconsin in the 1990s. Hidden Valley seed was increased by two seed companies the past year, but the seed supply sold out almost immediately after it became available.

### **2019 New Seeding at Pominville Farm**

The meadow fescue variety trial (seeded with alfalfa) at the Pominville Farm appears to have established successfully. The soil type allowed an April seeding, just before a prolonged wet period in the spring of 2019. Meadow fescue varieties will be sampled just prior to field harvests in 2020. Many of the European meadow fescue varieties being evaluated were developed in harsher environments than northern NY, so they will overwinter successfully, but relative competitiveness with alfalfa, and yield and quality of these varieties are unknown and yet to be determined through field research here.

### **Conclusions/Outcomes/Impacts:**

The tetraploid Tetrax meadow fescue continues to produce forage higher in NDFD than most other meadow fescue varieties, with a relatively low grass% in mixtures. Two new tetraploid meadow fescues are now available for evaluation in 2020. The combination of reduced-lignin alfalfa with meadow fescue can result in a large increase in forage NDFD. Crude protein content does not appear to be an issue with these alfalfa-grass mixtures, as long as the grass% in mixtures does not exceed 50%. In a 30% grass mixture, the addition of meadow fescue increases NDFD of the mixture by the same amount as replacing a normal alfalfa with HarvXtra. The combination can increase forage NDFD enough to significantly increase milk income using balanced rations.

### **Outreach:**

Because the value of this research is significant for growers across New York State, the results to-date of the NNYADP-funded alfalfa-grass research was reported at the following meetings/ conferences in 2019.

- Jan. 4 Oneida County Crop Congress, Clinton, NY
- King's AgriSeed Winter Meetings, Jan. 9: Coxsackie, NY; Jan. 10: Little Falls, NY; Jan. 11: Dryden, NY
- Jan. 29 5-County Winter Crop Meeting, Ithaca, NY
- NNY North Country Crop Congresses: Jan 30: Chazy; Jan. 31: Watertown,
- Central NY Forage Conferences: Feb. 27: Hamilton; Feb. 28: Johnstown
- Mar. 9 Steuben County Crop Symposium, Bath, NY
- May 29 Mid-Atlantic Regional Dairy & Beef Extension Inservice, Wilkes-Barre, PA
- Nov. 8 CCE Inservice, Ithaca, NY
- Jan. 15, 2020 Northeast Pasture Consortium conference, Fairlee, VT (invited talk).

**Next Steps:**

Our results continue to show that meadow fescue has great potential in mixture with alfalfa, and the combination of meadow fescue and high quality alfalfa should lead to significantly improved forage quality. Northern NY field trials results in cooperation with other regions have shown that grass yield or quality are not consistent across environments, highlighting the importance of regionalized trials.

The tetraploid variety Tetrax is very promising for having a relatively low grass percentage in mixtures, and with relatively high fiber digestibility. The German seed company, DSV, that developed Tetrax, has released a new tetraploid variety, Schwetra, and also will release another tetraploid within the year. We have obtained seed of all three tetraploids, and plan on establishing a new study in 2020 that includes the most promising varieties at three seeding rates with alfalfa.

The main issue remains getting a 20-30% grass mixture. In 2020, with a 2020 NNYADP research grant, we will continue to evaluate a large group of meadow fescue varieties, many of them not previously grown in North America, in NNY field trials.

**Acknowledgments:**

In addition to the NNYADP grant, USDA-NIFA provided funding for evaluation of GMO reduced-lignin alfalfa in pure and mixed stands for a multi-state project (NY, MN, and KY). We have also received funding from the National Alfalfa & Forage Alliance (alfalfa seed checkoff funds) to evaluate forage quality of a wide range of alfalfa varieties in Ithaca. These funding sources plus NNYADP grant funds are allowing us to focus specifically on improving alfalfa-grass production in NY.

**Reports and/or articles in which results of this project have been published:**

- Cherney, J.H. and D.J.R. Cherney. The right alfalfa-grass mix. Mar. 25, 2019. Hoard's Dairyman.
- Cherney, D.J., S.R. Smith, C.C. Sheaffer, M.S. Wells, and J.H. Cherney Alfalfa-Grass results differ by region. Jan. 2019. Progressive Forage magazine.
- Cherney, J.H., R.L. Kallenbach, and V. Picasso Risso. 2020. Chapter 20. Forage Systems for Temperate Areas. In (K. Moore et al., ed.) Forages: The Science of Grassland Agriculture. 7<sup>th</sup> ed.

**For More Information:**

Debbie J.R. Cherney, Department of Animal Science, Cornell University;  
djcb6@cornell.edu; 607-255-2882; [www.forages.org](http://www.forages.org).

# Northern NY Agricultural Development Program

## 2019 Project Report APPENDIX

### Maximizing Both Alfalfa and Grass Quality of Mixtures

**Table 1. Yield and Quality of Alfalfa, First Production Year, 2019, Jefferson & Lewis Counties, Alfalfa-Grass Mix Quality Project, NNYADP, Seeded in 2018.**

	HarvXtra	HiGest 360	HarvXtra	HiGest 360
	Jefferson County		Lewis County	
Yield, tons/a	5.23 a	5.09 a	3.26 a	2.94 b
Grass, %	50.8 a	49.4 a	65.0 a	66.0 a
NDF, %DM	29.3 a	29.4 a	27.7 a	26.8 b
ADF, %DM	22.7 a	22.9 a	21.4 a	20.6 b
Lignin, %DM	4.17 b	4.59 a	4.03 b	4.14 a
IVTD, %DM	88.0 a	87.3 b	87.3 a	87.7 a
NDFD, % NDF	59.1 a	56.7 b	54.5 a	54.1 a
CP, %DM	24.3 a	24.9 a	22.3 a	21.9 a

Means on the same line within the same county, with the same letters are not different.

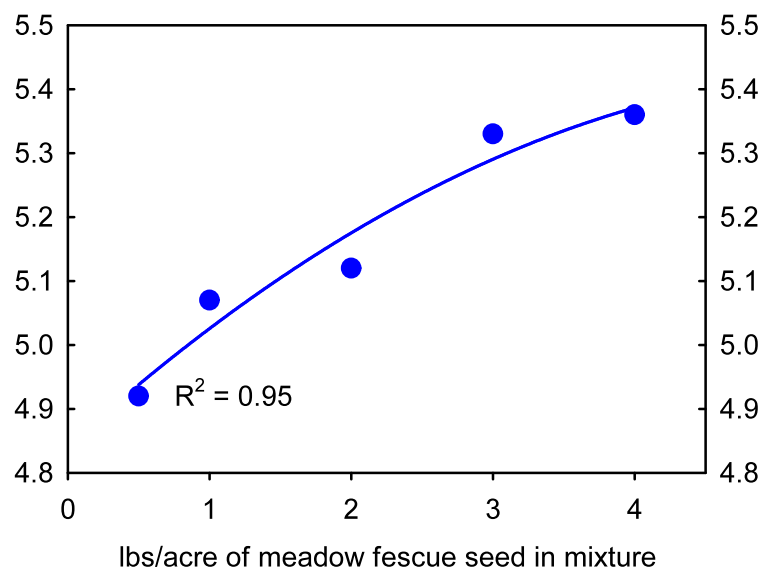
Grass% and forage quality means are weighted (by yield), average of 4 cuts, Jefferson County, 3 cuts, Lewis County

**Table 2. Yield and Quality of Meadow Fescue, First Production Year, 2019, Jefferson & Lewis Counties, Alfalfa-Grass Mix Quality Project, NNYADP, Seeded in 2018.**

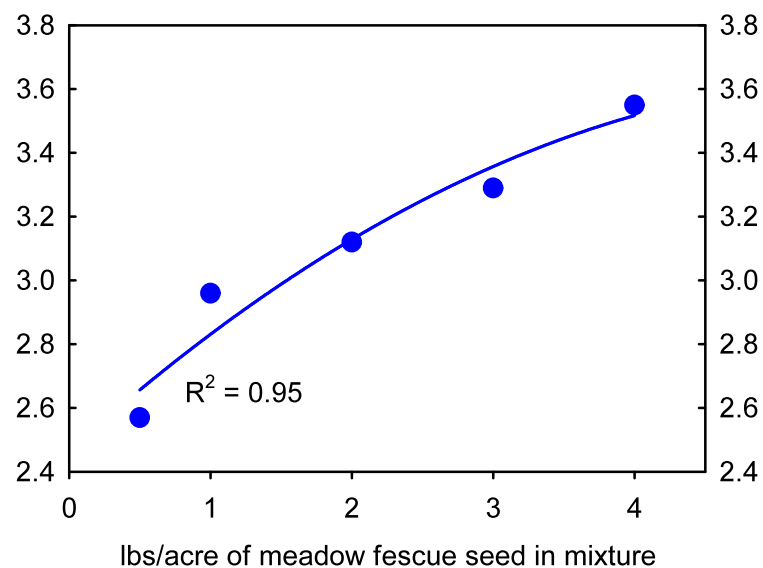
	Minto	Tetrax	Minto	Tetrax
	Jefferson County		Lewis County	
Yield, tons/a	5.15 a	5.17 a	3.28 a	2.91 b
Grass, %	55.7 a	44.5 b	68.2 a	62.8 b
NDF, %DM	55.7 a	51.1 b	54.8 a	51.2 b
ADF, %DM	32.9 a	30.9 b	32.1 a	30.6 b
Lignin, %DM	3.11 a	2.83 b	2.54 a	2.42 a
IVTD, %DM	88.9 b	91.0 a	89.7 b	91.2 a
NDFD, % NDF	80.5 b	82.8 a	81.2 b	82.8 a
CP, %DM	17.3 b	18.3 a	12.7 a	12.7 a

Means on the same line within the same county, with the same letters are not different.

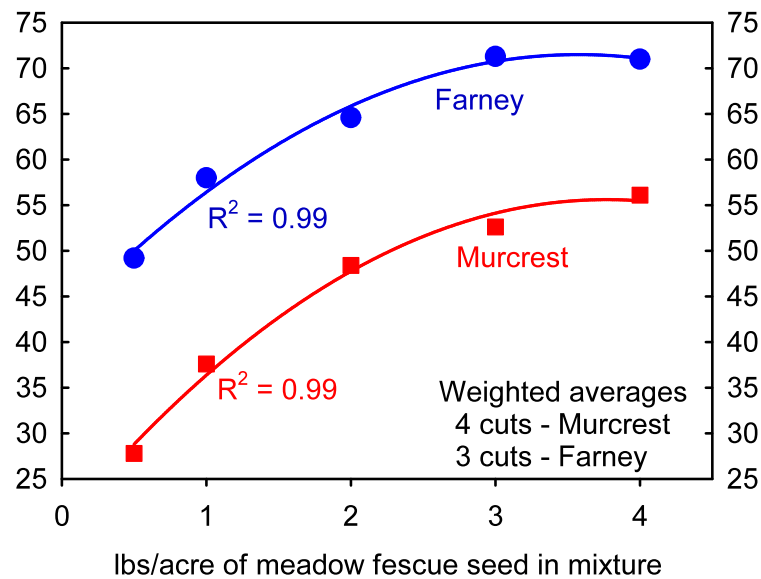
Grass% and forage quality means are weighted (by yield), average of 4 cuts, Jefferson County, 3 cuts, Lewis County



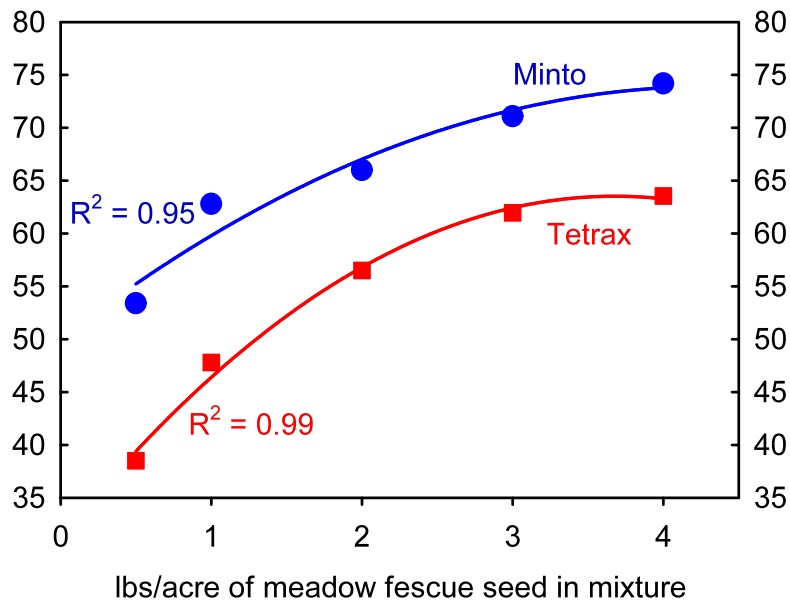
**Fig. 1. Dry matter yield across 4 harvests at Murcrest Farm in 2019, as influenced by grass seeding rate, Alfalfa-Grass Mix Quality Project, NNYADP.**



**Fig. 2. Dry matter yield across 3 harvests at Silvery Falls (Farney) Farm, 2019, as influenced by grass seeding rate, Alfalfa-Grass Mix Quality Project, NNYADP.**

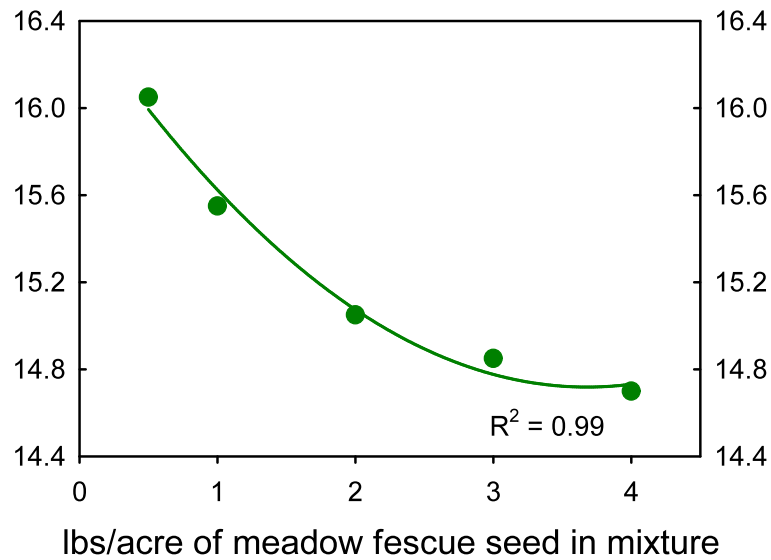


**Fig. 3. Grass percentage at Murcrest and Silvery Falls (Farney) farms for Tetrax meadow fescue, 2019, as influenced by grass seeding rate. Averages were weighted for yield, Alfalfa-Grass Mix Quality Project, NNYADP.**

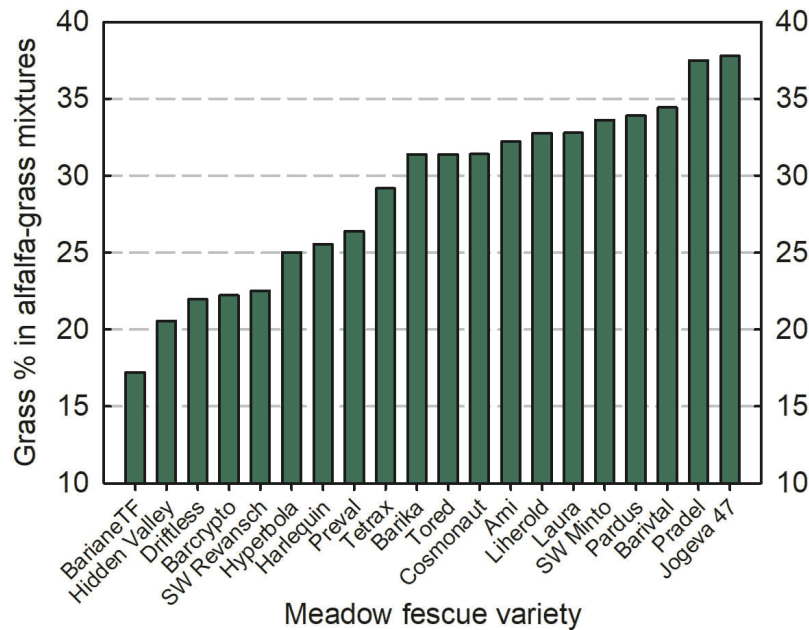


**Fig. 4. Grass percentage for Tetrax and Minto meadow fescue in 2019, as influenced by grass seeding rate. Average of 4 cuts at Murcrest and 3 cuts at Silvery Falls (Farney) Farm, weighted by yield, Alfalfa-Grass Mix Quality Project, NNYADP.**

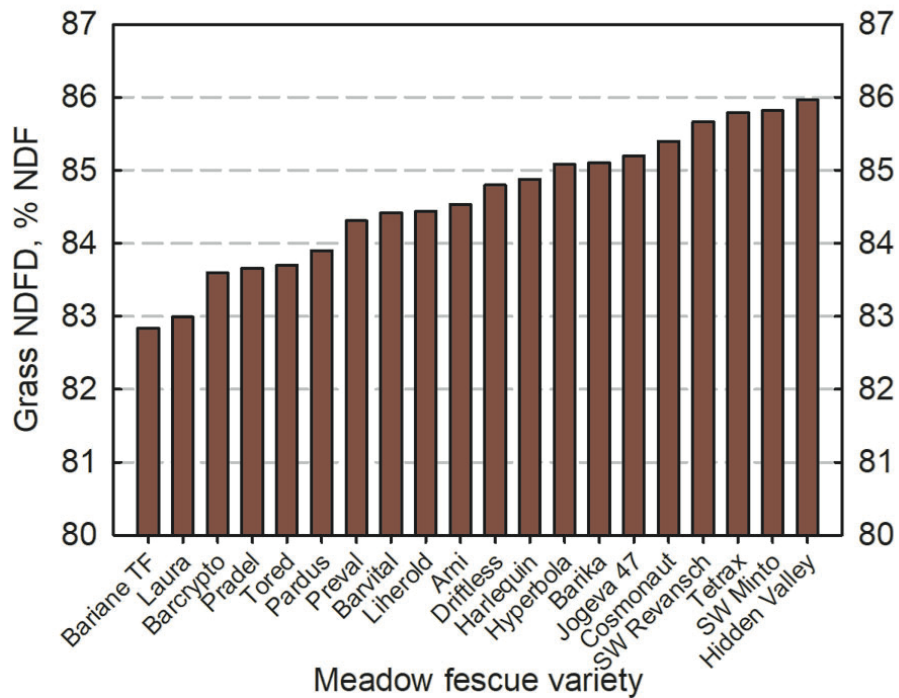




**Fig. 5. Crude protein in grass as influenced by grass seeding rate in alfalfa-grass mixtures in 2019. Average of 4 cuts at Murcrest and 3 cuts at Silvery Falls (Farney) Farm, weighted for yield, Alfalfa-Grass Mix Quality Project, NNYADP.**



**Fig. 6. Grass percentage of 19 meadow fescues and Bariane tall fescue at Graceway (Laribee) Farm in 2019. Average of 2 harvests, Alfalfa-Grass Mix Quality Project, NNYADP.**



**Fig. 7. Fiber digestibility averaged across 2 harvests of 19 meadow fescues and Bariane tall fescue at Graceway (Laribee) Farm in 2019, Alfalfa-Grass Mix Quality Project, NNYADP.**

**Photos:**



**Photo 1, left. NNYADP-funded meadow fescue variety trial, August 2019, Graceway (Laribee) Farm, Lewis County. Grass in the mix is obscured by lush alfalfa growth. Photo by Joe Lawrence.**

**Photo 2 right. Sampling alfalfa-grass prior to harvesting plots at the NNYADP-funded Alfalfa-Grass Mix Quality research trial at Murcrest Dairy Farm in Jefferson County, NY, June 2019. Photo by Jerry Cherney.**